Employment

1975

PREDICTING SECTORAL EMPLOYMENT IN COUNTIES AND MULTI-COUNTY AREAS

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Paper presented at AAEA annual meeting, Columbus, Aug. 10-13, 1975

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Continued emphasis on solving problems of economic development ~~developing~~ of rural areas will necessitate expansion of existing research techniques and development of new ones. As has been pointed out recently, a lag exists in development of subnational area forecasting with respect to other branches of economic forecasting (Richardson). This seems paradoxical in view of the need for such models in formulating public policy.

Nowhere is the need for subnational forecasting greater than in projecting economic trends at the county level. Representative problem areas which need a local economic forecasting system as an information input are the regional impact of federal expenditure programs, the formulation of local economic policy, and the adoption of rational education policies. At present, there exists a void in the development of models for predicting sectoral employment changes at the county level. The implication for rural development is obvious.

The primary objective of this Note is to develop a model to predict employment by industrial sector at the county level. Such procedure is viewed as a necessary first step in obtaining detailed occupational employment forecasts, the ultimate goal in employment forecasting. Emphasis in the model is placed on the role of state, national, and international demand in determining regional (i.e., county) employment changes.

This paper seeks to extend methodology used in developing employment prediction models for states (Babcock) to counties or multicounty areas. To the author's knowledge, the current work represents the first model developed to predict sectoral employment at the county level.

The Model[1]

Numerous combination of variables and transformations were explored in developing the employment prediction model. As finally structured, the model took the following form:

(1) $CE_i = B_0 + B_1\ TE + B_2\ E_i + B_3\ X + B_4\ TCE + B_5\ T$

where

CE_i = Total wage and salary employment in the i^{th} industry in the county

TE = Total U.S. wage and salary employment

E_i = Total wage and salary employment in the i^{th} industry in the U.S.

X = Total U.S. merchandise exports

TCE= Total state private wage and salary employment

T = Time

Variables TE, E_i, X, and TCE represent influences external to the county economy. TE and E_i reflect the impact of national industrial demand on the individual industries within the county while X is a measure of the strength of international demand for local output.

TCE incorporates the effect of state demand on production at the individual industry level within the county. The time variable, T, is included to account for factors influencing employment which otherwise could not be quantified or incorporated into the model.

Application

The regression model was used to examine changes in employment in Houston County, Alabama from 1962 to 1972.[2] Houston County, comprising a large geographic area and having a moderate population density, was selected because it typifies many rural areas experiencing economic development. The Houston County economy in the past, and to a large extent today, has been built upon an agricultural base but has become industrialized at a rapid rate within recent years. Because of the county's potential development as a growth center, forecasting future economic trends -- such as the employment dimension -- becomes imperative if orderly growth is to occur.

Primary purpose of the model was to develop coefficients for use in forecasting future levels of employment. All firms in the area were aggregated into 9 sectors based on the Bureau of Labor Statistics classification scheme. Data for the model were assembled from a number of government publications.[3]

Results

Table 1 contains coefficients for the independent variables, the R^2

statistic, F-value, and the Durbin-Watson statistic for each of the sectoral equations. The R^2 statistic indicates that the fit of the regression is quite good in all sectors. The R^2 statistic is greater than .95 in seven of the nine sectors. The F-values were all significant at the .05 level or above; seven of the nine sectors were significant at the .01 level.

The Durbin-Watson coefficients for each of the equations are found in the last column. There appears to be no significant autocorrelation in any of the equations. All of the Durbin-Watson statistics exceeded the 1 percent upper limits.

Multicollinearity existed among some of the independent variables in the equations. Existence of multicollinearity in the period under observation, however, does not present a serious obstacle since the objective of the model is prediction. The predictive ability of the equations remains intact as long as the multicollinearity continues into the prediction period (Thiel, Babcock).

An accuracy test was performed for the year 1973 to test the predictive ability of the model, Table 2. Actual values of the independent variables for 1973 were inserted in the regression equations and a forecast of the value of the dependent variable was made. When actual values were compared with the forecast values, the overall performance of the model indicated a deviation of 3.3 percent. Individual sectors exhibited more deviation, ranging from -20.2 percent to 23.1 percent.

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Based on empirical results, this model suggests that techniques exist for making reliable employment forecasts in subnational areas, namely, counties. This statement must be qualified since the data used in the model were highly aggregated into broad industrial sectors. Nevertheless, development of this model does represent a beginning point in formulating public policy decision models for areas experiencing economic development. The projections resulting from the model, even though consisting of employment estimates for aggregated sectors, should be useful to delineate the broad employment framework within which policy makers will most likely operate. Furthermore, the techniques can be logically extended to multicounty areas or planning regions. At this point in time, however, further refinements must be made before detailed occupational forecasting can be accomplished.

FOOTNOTES

[1] The model presented herein is an extension and modification of the state model developed by Babcock, op. cit.

[2] This time period was selected because of data limitations for prior years.

[3] Data for variables CE and TCE were obtained from various issues of County Business Patterns published by the Department of Commerce and from Civilian Work Force Estimates of the Alabama Department of Industrial Relations. Independent Variables TE and E_i were taken from Employment and Earnings Statistics for the United States 1909 - 1972. Data for variable X were obtained from the Survey of Current Business.

[4] For the national forecasts and assumptions used in developing them, see U.S. Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs. Vol. IV, (Washington, D.C.: U.S. Government Printing Office, 1971). Estimates for variable TCE were obtained from Alabama Department of Industrial Relations, Alabama Interim Manpower Projections for 1980, August 1974.

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Babcock, Michael W., An Urban-Regional Employment Demand Model," Review of Regional Studies 4: 1-10, Spring 1974.

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TABLE 1. Results of Employment Prediction Model, Houston County, Alabama, 1962-1972

Sector	Coefficients								
	TE	E_i	X	TCE	T	Intercept	R^2	F	D.W.
Contract Construction	-.347	-2.576	.023	24.891	210.775	7086.52	.97	23.94***[a]	2.26
Manufacturing	.046	.093	.054	-3.403	.199	1018.66	.94	12.94**	2.32
Transportation - Public Utilities	.021	-.359	.017	-.489	32.599	828.06	.98	44.60***	2.80
Wholesale Trade	.020	.759	-.013	-2.442	40.639	-317.69	.97	27.09***	2.60
Retail Trade	.028	-.109	.033	-4.938	203.581	4781.32	.96	145.16***	3.51
Finance - Insurance - Real Estate	-.046	.404	-.002	2.352	33.959	243.53	.98	49.78***	2.34
Services	-.102	-.048	.045	5.865	60.255	1424.68	.98	30.84***	2.68
Government	-.021	.132	.009	2.785	-26.840	-381.58	.98	42.58***	2.58
Agriculture	-.045	.332	-.012	3.793	2.299	-2.444	.92	9.64**	3.21

[a] * = 90%
** = 95%
*** = 99%

Table 2. Test of Predictive Ability, Employment Prediction Model, Houston County, Alabama, 1973

Sector	Actual	Forecast	Deviation: Absolute	Deviation: Percent
	----------	Number	-------	
Contract Construction	3344	2670	-674	-20.2
Manufacturing	5530	6318	+788	+14.2
Transportation - Public Utilities	1444	1778	+334	+23.1
Wholesale Trade	1396	1131	-265	-19.0
Retail Trade	4378	4354	-24	-.6
Finance, Insurance, Real Estate	1294	1237	-57	-4.4
Services	3043	3533	+490	+16.1
Government	3170	3417	+247	+7.8
Agriculture	1190	1181	-9	-.8
Total	24789	25619	830	3.3

Table 3. Predicted Employment by Industry, Houston County, Alabama, 1980.

Industry	Forecast
	No.
Contract Construction	5565
Manufacturing	7763
Transportation & Other Public Utilities	2595
Wholesale Trade	947
Retail Trade	5962
Finance - Insurance - Real Estate	1551
Services	5513
Government	3788
Agriculture	1064
Total	34748